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ARMY FACILITY ENERGY DEMAND AND THE IMPACT ON NATIONAL SECURITY

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ABSTRACT

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Sustaining the Army base ensures soldiers and their families have adequate resources to live and work. The focus of this paper is current and future energy demand for Army facilities and how demand will be met in the face of global resource shortages. Utility services for facilities on Army installations include: purchased electricity, steam, hot water and other utilities, and operation of electrical, heating, air conditioning, refrigeration, water distribution, and wastewater collection and treatment systems worldwide. In recent years, facility energy costs have escalated and demand has increased due to higher wartime operating tempo. This paper examines the impact this trend has on national security and the Army budget. This includes a survey of the Energy Policy Act of 2005 (EPACT 2005) and other defense relevant directives and an assessment of their impact on resulting Army energy strategy (e.g., Army Energy Strategy for Installations, Army Energy and Water Campaign Plan for Installations, etc.). This paper also addresses what the Army has accomplished to meet energy goals. Lastly, it considers the effect of energy efficiencies and employment of alternative sources of energy as well as the implications of failing to invest sufficient resources today to meet future energy demand.

ARMY FACILITY ENERGY DEMAND AND THE IMPACT ON NATIONAL SECURITY

According to a recent Construction Engineering Research Laboratory (CERL) report on energy trends on Army installations, "the days of inexpensive, convenient, abundant energy sources are quickly drawing to a close."[1] This fact has wide reaching implications for the United States Army and society in general. "To sustain its mission and ensure its capability to project and support the forces, the Army must insulate itself from the economic and logistical energy-related problems coming in the near and mid future."[2] Facility energy demand and energy costs have increased significantly in the last several years for the United States Department of Defense (DOD) and the United States Department of the Army (DA). The reasons for this include increased operating tempo (OPTEMPO) due to the Global War on Terror (GWOT) and escalating costs of all forms of energy. This combined with declining Army financial resources results in a mismatch between energy demand requirements and funding. The Army Energy Strategy for Installations (AESI) states:

> Our over reliance on fossil fuels and offshore energy sources jeopardizes our security and limits our freedom to act in the global environment…We compete for energy in an expanding world population with growing industrial markets in developing nations. Now, more than ever, we must manage these energy growth trends in the Army and limit our rising energy expenses.[3]

There are two questions the Army must consider in this regard. Can the Army afford increased investment in alternative energy and efficiencies? And, if it cannot, how will that inability impact national security? This paper will examine the impact of rising global energy demand and inadequate supply on national security, Army facility energy demand and the Army budget. This includes a survey of the Energy Policy Act of 2005 (EPACT 2005) and an assessment of other directives and their impact on resulting Army energy strategies (e.g., Army Energy Strategy for Installations, Army Energy and Water Campaign Plan for Installations, etc.). This paper also addresses what the Army has accomplished to meet energy goals. Lastly, it considers the effect of energy efficiencies and employment of alternative sources of energy as well as the implications of failing to invest sufficient resources today to meet future Army energy demand.

Background

World consumption of oil and natural gas and projected future demand for both are not in alignment with the Nation's or the United States Army's demand.[4] According to the aforementioned CERL report on energy trends, several issues affect energy options from a global perspective.[5] The first issue is the availability of oil and gas. In this regard, domestic and

global production of oil and gas are either nearing or past their peak.[6] The second issue is affordability. Increased demand and limited supply will drive prices up which affects affordability. The third issue is sustainability. Global consumption of fossil fuels and its environmental impact continue to grow while natural resources are depleting at an alarming rate. For example, it took 100 million years to create the energy the world uses in 1 year.[7] The final issue is security. The United States has 5 percent of the world's population, yet it uses up 25 percent of the world's annual energy production. Additionally, the United States currently imports 26 percent of its total energy supply and 56 percent of its oil supply. This disproportionate consumption of energy relative to global consumption impacts the security of the United States as well as how it is viewed by the rest of the world.[8] To exacerbate this situation, the same aforementioned CERL report on energy trends states, "Worldwide consumption of energy is projected to increase 60 percent by 2030 and may triple by 2050."[9] The implications are staggering in terms of how future global and Army energy demand will be met.

The largest single energy user in the United States is DOD. It uses 62% of the facility energy consumed by the Federal government.[10] Within DOD, the Army consumes 36% of facility energy. The largest component of energy costs is electricity.[11] Army energy demands in the Continental United States (CONUS) will grow as major global rebasing will re-station 30,000 troops from Europe and Asia to the United States and as the "Army's transformation of home base support of deployed elements expands computer-processing needs."[12] Assets to support the production and distribution of energy use for Army facilities include: over 13,200 miles of electric power lines, over 1,800 miles of natural gas distribution, and over 12,650 miles of water lines and wastewater collection systems. The replacement value of Army-owned utility assets is over $12B.[13] Because the Army is the largest utilities consumer within DOD it "must be the leader in energy efficiency and the use of renewable energy products and emerging technologies"[14] according to a recent memorandum signed by the former Secretary of the Army Francis J. Harvey in support of Energy Awareness Month.

The External Challenge: Impact on National Security

Army energy challenges exist in the larger context of global energy demand and supply. Thus, a broader view of energy beyond Army facilities can be examined from several perspectives in order to address the impact on national security. The first perspective is how "recent changes in global energy markets are posing the most profound challenge to American hegemony since the end of the Cold War",[15] according to a recent Washington Times article

titled “Fueling United States Adversaries”. Leading energy producers are using export windfalls to “challenge U.S. interests, intimidate U.S. allies and, in some cases, bankroll terrorist and insurgent groups fighting U.S. forces.”[16]

Iran, Venezuela and Sudan are examples of countries that benefit from increased oil revenues, while at the same time threatening the security of certain regions of the world. According to the Institute for International Economics, Iran’s oil exports have grown from about $15B in 1995 to $46B in 2005.[17] Iran’s annual oil revenues have increased approximately $30B (200%) compared with a decade ago. This windfall is being used to boost Iran’s domestic spending and to finance groups such as Hezbollah, Hamas and Islamic Jihad in Palestinian territories. Additionally, according to the aforementioned article on fuel and United States adversaries, Venezuela is using oil revenues to finance a foreign policy at odds with United States, even though the United States is Venezuela’s single biggest oil-export market.[18] Lastly, because China has become an emerging energy importer, the revenues created by their oil purchases are funding extensive supply and infrastructure projects in countries like Sudan that are known for human rights abuses. (Sudan began exporting oil seven years ago).[19]

Energy demand should also be examined from a strategic environmental perspective. Use of fossil fuels results in the production of green house gases, pollution, contaminated water (in some cases) and environmental damage. Use of nuclear power results in hazardous waste products, potential accidents, unusable land, etc.[20] Use of renewable energy is not as harmful to the environment but is not yet widely available.

According to the National Security Strategy (NSS), the United States has worked with industrialized and emerging nations in developing and producing hydrogen, clean coal, and advanced nuclear technologies. It has joined with Australia, China, India, Japan, and the South Korea in forming the Asia-Pacific Partnership for Clean Development and Climate to accelerate deployment of clean technologies to enhance energy security, reduce poverty and reduce pollution.[21] The way ahead includes working with resource rich countries to expand the range of energy suppliers and to build global nuclear energy partnerships to develop and deploy safer nuclear recycling and reactor technologies. One of the objectives of the NSS is to provide reliable, emission free energy without making available separated plutonium that could be used by rogue states or terrorists for nuclear weapons. Additionally, the NSS states the United States is investing in zero emission coal-fired plants, revolutionary solar and wind technologies, clean, safe nuclear energy, and cutting edge methods of producing ethanol.[22]

Viewed from another perspective, energy presents a key security concern for the United States because of its dependence on too few suppliers. According to a recent report from the

President's Council of Advisors on Science and Technology on energy, "President Bush has stated that the United States is "addicted to oil" and has set a goal to reduce dependence on imported oil."[23] The NSS states, "The key to ensuring energy security is to diversify in the regions from which energy resources come and in the types of energy resources on which we rely".[24] The successes (since 2002) include work the administration has accomplished with trading partners and energy producers to expand the type and sources of energy, to open markets and strengthen the rule of law, and to foster private investment that help develop the energy needed to meet global demand.[25] The intent is to reduce reliance on foreign energy sources. By diversifying suppliers within and across regions it reduces opportunities for corruption and diminishes the leverage of irresponsible rulers.[26]

A final perspective is the impact of increased energy demand on Army strength and readiness. If there are not enough energy resources to support base support services (i.e., facility utilities) or logistical support to the war fighter (i.e., tanks, trucks, helicopters, weapon systems, etc.),[27] the Army cannot meet the military missions of the NSS to fight and win the war on terror.[28] In turn it could not meet the missions of the National Defense Strategy (NDS): to secure the United States from direct attack, to secure strategic access and retain global freedom of action, to strengthen alliances and partnerships and to establish favorable security conditions conducive to a favorable world order.[29] Lastly, the Army could not meet the mission of the National Military Strategy (NMS): to protect the United States against external attacks and aggression, to prevent conflict and surprise attacks and to prevail against adversaries.[30] The NMS sums it up well stating, "Executing the NMS requires a force able to generate decisive effects in any contingency and sustain multiple, overlapping operations. The force must have the capabilities necessary to create and preserve an enduring peace."[31] According to Joint Publication (JP) 5-0, Joint Operation Planning, a critical requirement is "an essential condition, resource, and means for a critical capability to be fully operational."[32] The ability to defend our country (critical capability) requires adequate sources of energy (critical requirement) to sustain the military's facilities and logistics.

In short, from a strategic point of view the United States and the Army are challenged by a number of energy relevant concerns. These include: dealing with rogue states profiting by the demand for energy and, ultimately, financing the increased threats to the United States and its interests; decreasing the environmental impact of energy use; and keeping energy supplies secure and available for military forces to maintain the critical capability necessary to defend the United States. These concerns provide more impetus than ever for the United States and Army to place meeting future energy demands at a very high priority for programming and funding.

The Internal Challenge: Meeting the Army Institutional Energy Challenges

Prior to discussing how the Army resources facility energy demands, it's important to explain (in simplified terms) the process it uses to determine resource requirements and funding allocation. The process is called Planning, Programming, Budgeting and Execution (PPBE). Secretary of Defense Robert McNamara initiated the rudimentary beginnings of PPBE (formerly called the Planning, Programming, and Budgeting System (PPBS)) in 1962. The Secretary of Defense Rumsfeld changed it to the PPBE in 2003.[33] The most recent DA product in the programming phase (as of this writing) is called the FY 08-13 Program Objective Memorandum (POM). This discussion will provide information on how requirements are determined, validated and prioritized during the PPBE process. This is important, as this process determines the amount of Army funds set aside for facility energy use in the out-years.

The development of the FY 08-13 POM involves numerous phases at the Office of the Secretary of Defense (OSD) and Army level. The focus of this discussion will be what occurs at the Army level for the Operation and Maintenance (O&M) appropriation. The Deputy Chief of Staff (DCS) G-3/5/7, responsible for operations and planning functions for the Army, prepares The Army Plan (TAP), which defines Army planning assumptions and sets requirements and priorities based on guidance from the Secretary of Defense (SECDEF), Secretary of the Army (SA) and Chief of Staff of the Army (CSA). The NSS, NDS, Quadrennial Defense Review (QDR), Strategic Planning Guidance (SPG), and Joint Operational Concept inform TAP. TAP consists of several sections; the Army Strategic Planning Guidance (ASPG); Army Planning Priorities Guidance (APPG); Army Program Guidance Memorandum (APGM); and Army Campaign Plan (ACP).[34] The capability requirements based on these documents are identified and translated to resource requirements by the Army staff and submitted to Program Evaluation Groups (PEGs). The PEGs include representatives from the installation, training, equipping, manning, organizing and the sustaining components of the Army staff. The PEG's primary role is to "program and monitor resources to perform Army functions assigned by 10 USC, Subtitle B."[35]

There are several Army forums above the PEG level that review Army policy and resource allocation issues, set policy, approve guidance and priorities, and monitor staff implementation of those decisions. They are the Army Resources Board (ARB), the Senior Review Group (SRG), the Planning, Programming, Budgeting Committee (PPBC) and the PPBC Council of Colonels.[36] Depending on the forum, the chairman and co-chairman representatives come from the Army Secretary, Under Secretary, Chief of Staff, Vice Chief of Staff, DA G-3/5/7 (Plans and Operations), DA Program Analysis and Evaluation (PAE) Office, and the Army Budget Office

(ABO). The goals of these forums (to include the PEGs) are to identify, prioritize and make recommended funding decisions for the Army programs over the POM years. Staying within a constrained fiscal amount, otherwise known as the total obligation authority (TOA), and meeting the mission of TAP is one of the biggest challenges of the Army.[37] After Army preparation and the appropriate reviews, the POM is submitted to OSD, the Office of Management and Budget (OMB), and Congress for approval and funding. This is a simplified explanation of a very complex process; however, for the purposes of this paper, the author's intent is to provide a framework to explain how requirements are developed at the "grass roots" programming level.

In preparation of the FY 08-13 POM, the DA PAE Office directed requirements be identified as "requested requirements", "validated requirements" and "validated critical requirements". The Technical Guidance Memorandum (TGM) (document that informs DA POM requirements) identified "critical requirements" as the minimum amount of resources required to achieve the Army Campaign Plan (ACP).[38] In regard to facility energy critical requirements, the ACP requires safe, reliable and secure utilities, which are critical to enable the force to fulfill its strategic roles and missions.[39]

Representatives from the Assistant Chief of Staff for Installation Management (ACSIM) and the Assistant Secretary of the Army for Installations and Environment (ASA I&E) co-chair the Installation (II) PEG. The II PEG is primarily responsible for programming resources for Army installation base support services, of which facility energy demand is a sub-element. Members from the ACSIM Resource Integration Office (RIO) are key players for the administration and execution of the II PEG. As part of the ACSIM POM process, functional experts in installation base support services from the DA and ACSIM staff are required to brief these requirements to the Resource Analysis Team (RAT). The RAT is the working level of the PEG. The RAT team consists of members from ACSIM, DA PAE, Army Budget Office, DA G-3/5/7, ASA (I&E), Army National Guard and Army Reserves.

Due to the turnover of personnel, the duties to chair the RAT briefings during the FY 08-13 POM fell on the author as the Deputy Division Chief of the ACSIM RIO.[40] The duties of the RAT Chairman were to facilitate the briefing and determine (through consensus) how much of the requirements presented were considered "valid" versus "critical". From the author's experience, the final decision on what requirements are "valid" versus "critical" rests upon the RAT Chairman if there is no consensus.[41]

Utility costs related to facilities were developed by the Facility and Housing Directorate of ACSIM and briefed to the RAT. The Army utility program in support of facilities includes procurement, production and distribution of utilities. This includes: connection charges;

privatization impacts; energy management; alternatively financed energy savings performance contracts; purchased electricity, steam, hot water and other utilities; and operation of electrical, heating, air conditioning, refrigeration, water distribution, and wastewater collection and treatment plants and systems worldwide. The baseline calculation for utility requirements included FY 05 actual execution costs of natural gas, electricity, water, wastewater, heating and air conditioning. Added to this were other factors. These included: energy cost escalation; inflation factors to FY 08-13; utility privatization contracts; the impact of modularity, global rebasing, and base realignment and closure moves; requirements related to the Energy Policy Act of 2005 (EPACT 2005); and the impact of morale, welfare and support activities on utility support.[42] The Army utility program included Active Army, Army National Guard and Army Reserve Operation and Maintenance (O&M) requirements and excluded military construction requirements.

The validated POM requirements for FY 08 from the FY 06-11 POM build (the last full POM prepared in FY 04) was $878.2M.[43] The requested requirement for FY 08 during the build for the FY 08-13 POM (prepared in FY 06) was $1.060B.[44] This is a 21% growth in requirements. The reason for the growth was increased utility and energy prices, privatization program costs for new contract awards after FY 05 and support to meet the EPACT 2005 (to include facility metering). Historical costs for the total utility program in FY 03 through FY 05 were $694M, $792.8M and $941.7M respectively (per PPBE official data base prior year information). The total validated critical requirement for FY 08 was determined to be $1.000B[45], which equates to a growth of 14% over the last validated requirement ($878.2M) for the same year from the FY 06-11 POM build. Table 1 represents the amount of requested and validated critical O&M Army utility requirements submitted for the FY 08-13 POM. Reductions from the requested requirements to the validated critical requirements were primarily related to reprogramming base realignment and closure, global re-basing and modularity related energy requirements to another program designed specifically to capture costs related to these initiatives. Because the FY 08-13 POM process is not yet complete, exact funding for these requirements cannot be published:

Year	Requested Requirement[46]	Validated Critical Requirement[47]
FY 08	$1.060B	$1.000B
FY 09	$1.027B	$1.024B
FY 10	$1.044B	$1.017B
FY 11	$1.040B	$1.037B
FY 12	$1.061B	$1.051B
FY 13	$1.079B	$1.069B

Table 1

Army Energy Efficiencies

The discussion up until now has been about programming for basic Army facility energy requirements and factors that have increased demand and costs over the POM years. The implementation of energy efficiencies to decrease energy demand and reduce costs requires additional funds to implement. The recent CERL report on energy trends and implications for U.S. Army installations states,

> Our best options for meeting future energy requirements are energy efficiency and renewable sources. Energy efficiency is the least expensive; most readily available and environmentally friendly way to stretch out current energy supplies…the potential savings for the Army is about thirty percent of current and future consumption.[48]

Another recent report presented to President Bush by the President's Council of Advisors on Science and Technology on energy imperatives states,

> It is evident that most energy losses result from electricity generation and transportation; in these sectors, only a minor portion of the input energy results in useful work. This suggests that there are significant opportunities to improve the efficiency of today's power plants and vehicles.[49]

Through legislation, directives and regulations, the United States President, Department of Defense (DOD) and the Army have taken significant steps to direct the implementation of energy efficiencies and reduce energy consumption. For example, the EPACT 2005, signed by the President in August 2005, requires the following measures be taken to manage the Army's energy use:

- Sets new energy reduction goals of 2% per year from FY 06 to FY 15.

- Requires the installation of energy monitoring systems such as metering of all buildings by 2012.
- Requires all new equipment, products and appliances to be Energy Star or Federal Energy Management Program (FEMP) compliant.
- Requires the incorporation of sustainable design practices and 30% more efficient design than the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards for new construction and renovation.
- Requires the use of renewable energy sources for electrical purchases.[50]

The Army has recently taken several steps to meet the goals of EPACT 2005. The former Secretary of the Army Francis J. Harvey signed a memorandum on 26 September 2006 declaring October 2006 as Energy Awareness Month. He informed the Army it must do what it can to achieve energy efficiencies and exceed the mandate of a 2 percent energy use reduction per year from 2006 to 2015 to meet EPACT 2005.[51]

DOD Instruction 4170.11, Installation Energy Management, further promotes energy efficiency by requiring:

- The DOD utility infrastructure is secure, safe, reliable and efficient.
- Utility commodities are procured effectively and efficiently.
- Energy and water conservation efforts are maximized
- DOD components invest in cost-effective renewable energy sources, energy efficient facility designs, and regionally consolidates Defense requirements to aggregate bargaining power to get better energy deals.[52]

Army Regulation (AR) 11-27 Army Energy Program (AEP), published in February 1997, states its objectives is to:

- Ensure the availability and supply of energy to the Army in accordance with mission, readiness and “quality of life” priorities.
- Participate in the national effort to conserve energy and water resources without degrading readiness, the environment, or quality of life.
- Attain established energy and water conservation goals.
- Participate in research and development (R&D) efforts regarding new and improved energy technologies contributing to defense and energy conservation.[53]

To encourage members of the Army to comply with AEP objectives, the aforementioned regulation also advocates the use of awards for individuals or organizations that implement energy and water conservation solutions and develop successful energy management programs. Awards listed include the Energy Management Professional Enhancement Program,

the annual Secretary of the Army Energy and Water Conservation Award and Federal Energy and Water Management Awards.[54] As an example of innovation, a group of individuals from the New Jersey Army National Guard was awarded the Secretary of the Army Energy and Water Conservation Award for acquiring buy-in and funding for the first photovoltaic (silicon-based semiconductor material that converts sunlight into electricity) project located at Fort Dix for a 130,000 square foot facility.[55] This project resulted in an energy cost avoidance of $69,000 in FY 05. This is one of many examples of the energy efficiencies generated as a result of incentive programs like these.

Through FY 2005, the Army has made significant progress in meeting past energy goals. It has reduced energy use in standard buildings by 29.4% from the FY 1985 baseline (although OPTEMPO due to GWOT increased energy use from FY 03 to FY 04/05 by 3%[56]). The Army has reduced energy use in industrial facilities by 52.1% from the 1990 baseline and reduced greenhouse gas emissions by 34% since 1990, exceeding the already established goal of 30% reduction by FY 10.[57]

In furtherance of energy conservation goals, the Army has implemented an Army Energy Conservation policy, which governs more efficient use of computers, electricity, heating and cooling, and vehicles.[58] The policy directs that all purchased heating, ventilation and air conditioning (HVAC) equipment will be Energy Star rated for any new or replacement application.[59] The Army also implemented the Army Metering Implementation Plan to meter all federal facilities with advanced meters by 2012 where practicable.[60] The plan lays out the methodology to determine cost effective metering and process for prioritizing installations. “The primary purpose and benefit of metering Army facilities is to motivate… the energy conservation behavior among building occupants by providing the means for energy consumption accountability.”[61]

Another Army goal to achieve energy efficiencies is to evaluate all utility systems for feasibility of privatization by FY 07. So far, the Army has privatized 111 utility systems. This success in privatizing utility systems has resulted in re-capitalized improvements to utility systems, which provides energy efficiencies and reliable services. Of the remaining 240 systems owned by the Army, 154 are exempted or pending exemption and 86 are under evaluation. The completion of evaluation of all utility systems is projected to be in FY 11.[62]

The Army has taken measures to reduce the cost of energy demand by developing the Army Energy Strategy for Installations (AESI) signed by the Secretary of the Army and Army Chief of Staff on 8 July 2005.[63] This document provides guidance on eliminating waste, improving efficiency and implementing new technologies and standards. Its purpose is to

provide direction for providing “safe, secure, reliable, environmentally compliant, and cost-effective energy and water services to Soldiers, families, civilians and contractors on our installations.”[64] The AESI looks out to the year 2025 and takes into consideration predicted conditions of domestic and imported energy resources and the state of the marketplace. The AESI sets the Army’s latest energy goals and articulates five major initiatives supported by specific actions to achieve the energy goals:[65]

- Eliminate energy waste in existing facilities
- Increase energy efficiency in renovation and new construction
- Reduce dependence on fossil fuels
- Conserve water resources
- Improve energy security

The problem, however, is finding matching resources to execute the energy strategy. During the FY 08-13 POM build, the AESI was used as a guide to determine requirements related to each of the five initiatives. These initiatives were identified in a separate program from the utility requirements described previously. The requested requirements were: re-capitalizing non-privatized utility systems (approximately $33M-$37M annually from FY 08 to 13); promoting energy efficiency in Army facilities ($52M - $57M); reducing dependence on fossil fuels ($63M – 75M); conserving water resources ($6M - $14M); and improving utility security ($30M - $44M).[66]

The total requested requirements and validated critical requirements related to the five initiatives are as follows:

Year	Requested Requirement[67]	Validated Critical Requirement[68]
FY 08	$184M	$138M
FY 09	$190M	$142M
FY 10	$196M	$147M
FY 11	$204M	$153M
FY 12	$222M	$166M
FY 13	$175M	$131M

Table 2.

Critical requirements were determined to be approximately seventy-five percent of the requested requirement. As previously stated, funding against these requirements cannot be identified until the FY 08-13 POM process is complete.

Another document was developed by the Army to enable the execution of the AESI. The Army Energy and Water Campaign Plan for Installations was signed 1 August 2006.[69] It provides a road map for achieving the five initiatives of the AESI. Specifically it:

- Provides the way ahead by identifying actions, milestones, and funding strategies to meet the energy and water conservation goals of the EPACT 2005 and other applicable policies and regulations.
- Identifies management and institutional requirements to achieve actions.
- Identifies funding strategies and resources.
- Describes the desired end state for actions and identifies the metrics of success.
- Provides a year-by-year investment plan that coordinates all Army energy/water users and policy components (security, privatization, procurement, technology, construction, and environment) into cohesive and measurable objectives designed to meet the goals.[70]

This document was still in draft during the build of the FY 08-13 POM. It will likely be used as a comprehensive guide for development of requirements in future POMs. The document expands upon the AESI to include identifying alternative sources of funding for energy projects. Sources include alternative financing (generally meaning public/private partnership investments as opposed to the use of appropriated funds) linked to Energy Saving Performance Contracts (ESPC) and Utility Energy Services Contracts (UESC).

ESPC "allows the Army to obtain energy project services from an energy services company in exchange for the utility cost avoidance generated by projects."[71] The contract term is generally 15 years. Through FY 05, private sector investment has yielded $1.6B for federal facilities. UESC are similar to ESPCs. The concept involves the utility company identifying an economically attractive energy project candidate. If it is feasible, the utility company will enter into a contract with the Army and they (the utility company) will study, design, finance, install and sometimes even maintain the energy savings project. The Army pays for the project with annual O&M utility savings. The contract term cannot exceed 10 years.[72] The utility companies have invested approximately $1B for energy projects at federal facilities since 1992.[73]

A good example of the use of a UESC occurred when a Fort Knox energy team was awarded the 2006 Federal Energy and Water Management Award – Renewable Energy (Small Group category). In FY 2005, Fort Knox used a UESC to replace 70 percent of an existing

inefficient heating and cooling system (which serviced 38 buildings in the Fort Knox Disney Barracks area) with geothermal heat pumps, thus taking advantage of renewable geothermal energy technology. Additionally, the buildings were modernized with new ventilation systems to improve air quality and were wired for control and energy management. This resulted in a cost avoidance of $807K in FY 05.[74]

Renewable Energy

The use of renewable energy has the potential of reducing United States dependency from foreign sources (thus, protecting its security), reducing energy demand and costs and protecting the environment. As with energy efficiencies, the United States President, DOD and DA have taken steps to direct and/or encourage the use of renewable energy. The following facts are provided regarding current renewable energy use. This will be followed by a discussion of guidelines and directives provided for future renewable energy use at the national and military service levels.

In 2003, renewable energy made up 6 percent of the U.S. energy usage. Examples of renewable energy are the use of high temperature solar and photovoltaic energy, wind, bio-fuels (liquid transportation fuels made from plant matter instead of petroleum), biomass (energy produced from organic residues), hydropower and geothermal sources (energy from underground reservoirs of steam, hot water and hot dry rocks). The breakdown of the use of renewable energy in 2003 was 2.9% for biomass, .1% for solar, 2.8% for hydroelectric, .3% for geothermal and .1% for wind.[75] Due to reductions in capital costs, reliability improvement, and the volatility of fuel prices and environmental costs of generating electricity from fossil and nuclear fuel sources, renewable energy is regarded as an increasingly profitable and rational investment.[76]

President Bush signed the Advanced Energy Initiative on 20 February 2006 in an effort to further advance energy initiatives.[77] The initiative proposed a 22 percent increase in FY 07 funding for clean-energy technology research at the Department of Energy in two areas. One is changing the way vehicles are fueled and the other is changing the way homes and businesses are powered. For the first area, the initiative advocates improving energy security with greater use of technologies that reduce reliance on oil by improving efficiency and by use of alternative fuels from biomass and fuel cells that use hydrogen from domestic feed stocks. In the second area (and more pertinent to this paper), the initiative offers investments in generating more electricity from clean coal, advanced nuclear power, and renewable sources such as wind and solar energy. The goal is to provide “reliable, affordable and clean energy future for all

Americans."[78] The investments in these technologies will have a cascading effect on future energy sources for the Army.

Section 203 of the EPACT 2005 provides goals for the percentage of electricity energy used that must be from renewable sources for federal buildings.[79] The goals are: not less than 3 percent in FY 2007 through FY 2009, not less than 5 percent in FY 2010 through FY 2012 and not less than 7.5 percent in FY 2013 and each fiscal year thereafter. The policy states that if the renewable energy is produced on site, on federal lands, or produced on Indian land and is used by the installation; the amount produced is doubled for purposes of compliance with these goals.[80] Section 204 of the EPACT 2005 directs the General Services Administration to establish a photovoltaic energy commercialization program for procurement and installation of photovoltaic solar electric systems for electric production in new and existing public buildings. The idea is to accelerate the growth of commercially viable photovoltaic industry.[81]

In March 2006, DOD was required to provide a status report on DOD Renewable Energy Assessment. The report was in response to a Senate Appropriations Committee Report on HR 2528, (109-105), Military Quality of Life and Veteran Affairs Appropriations Act, 2006, which called for the Secretary of Defense to report on the progress of an implementation plan on renewable energy.[82] All services reported several projects completed or underway in the categories of solar, wind, geothermal, biomass and hydrogen initiatives. It found that direct appropriations, alternative financing and lease agreements were the most common ways to execute renewable projects. By the end of FY 05, renewable energy accounted for 8.3% of all electricity used by U.S. military installations, which exceeded the 3% goal required in FY 07. In November 2005, the Deputy Under Secretary of Defense for Installations and Environment issued a longer-term goal (than the EPACT 2005 goal) for use of renewable energy to be at least 25 percent by FY 2025. The goal of DOD is to lead the Federal government in the use of renewable energy and to reduce its reliance on fossil fuels.[83]

Finally, the Army addresses the use of renewable energy in the Army Energy Strategy for Installations (AESI) document.[84] It addresses reducing dependency on fossil fuels by substituting renewable resources for purchases of electricity from fossil fuel sources when life-cycle cost-effective. This includes meeting federal renewable goals established by the EPACT 2005 by procuring renewable energy from marketers, federal power administrations, and third party producers. It also states, "The Army must become a leader in acquiring innovative, cost-effective technologies such as geothermal, solar, biomass, and wind energy, in concert with our mission".[85]

Conclusions and Recommendations

The United States and Army have made major strides in identifying what needs to be accomplished to meet and secure future energy demand. Documents such as the NSS, NDS and NMS spell out meeting future energy demand by reducing reliance on exports, becoming more energy efficient and developing alternative energy sources. From an Army facilities perspective, the Army has answered these challenges by meeting past energy goals, developing key energy documents such as the Army Energy Strategy for Installations and the Army Energy and Water Campaign Plan for Installations as well as garnering funds from limited appropriated sources and through partnership with private investors for alternative financing. These documents and initiatives provide roadmaps for becoming more energy efficient, seeking alternative sources of energy, becoming more energy independent, and ensuring future Army energy demand will not continue to damage the environment. "A secure, reliable, and cost effective energy system must be robust, diverse and aggressively incorporate renewable [energy], energy efficiency, and intelligent use of fossil fuels,"[86] according to the CERL report on energy trends. Having developed a roadmap, more resources must be provided to execute appropriate plans. The following are the author's recommendations to address how the Army can meet future facility energy demand with limited resources:

- **Continue to identify, prioritize and update requirements as spelled out in the Army Energy Strategy for Installations, the Army Energy and Water Campaign Plan for Installations and other related documents.** This translates to submitting these requirements not only through the POM process but also through current year initial, mid-year and year-end budget processes (if and when windows open for identification of un-financed requirements). Further, the Army must identify known paybacks or savings (tangible and intangible) to support requirements. Saving money in the long run is always part of a good justification for funding consideration. Additionally, there is a higher probability of obtaining funds if these requirements are repeatedly visible to resource managers. Keep energy projects "on the shelf", and ready to execute (where contractually possible). If projects are not funded through normal budgeting and programming processes, keeping a list of projects readily executable, especially at the end of the year, increases the likelihood of obtaining year-end migratory funds.
- **Educate all key players in the resource arena on the impact of energy demand on the United States and Army.** For example, make office calls to members of the Resource Analysis Team and senior members of the Installation Program Evaluation

Group (II PEG) to educate them on energy demand and requirements. Do not wait until the POM process begins. This will ensure a basic foundation of energy knowledge is laid to facilitate the build of the POM. In this way, information will be more easily retained, understood and articulated by key players in the resource arena as the requirements compete at higher resource decision levels.

- **Emphasize strategic communications. Where possible, provide good news stories (i.e., Army Times, Army web sites, local papers, budget or programming documents) where energy programs have been implemented.** Address the benefits both from a tangible and intangible cost savings and environmental point of view. Use input provided by award winners of the annual Secretary of the Army Energy and Water Conservation Award and Federal Energy and Water Management Awards. Anecdotes are the best way for the general public and resource managers to remember and articulate to others the benefits of smart energy practices.
- **Address energy demand issues (from a strategic point of view) on military power in forums such as the Army War College, National Defense University and other affiliated military institutions.** Champions of these issues could be born in these settings. These same champions could carry these issues to other more senior level assignments and thus influence favorable solutions.
- **Continue to leverage private funds to make facilities more energy efficient.** The Army has garnered billions of dollars in investments from alternative sources of funds to make Army installations more energy efficient. The continued use of Energy Saving Performance Contracts, Utility Energy Services Contracts and any other innovative partnership that benefits both the user and supplier of energy is a smart thing to do.
- **Continue to provide incentives (awards, cash, etc.) for energy efficient initiatives.** Non-monetary awards can go a long ways towards motivating innovative and creative thinking on how to meet current and future demands for energy. Ensure successes are made public through local and national Army information operations.

Endnotes

[1]Donald F. Fournier and Eileen T. Westervelt, *Energy Trends and Their Implications for U.S. Army Installations*, Construction Engineering Research Laboratory, ERDC/CERL TR-05021 (Washington, D.C.: U.S. Army Corps of Engineer, September 2005), xi.

[2]Ibid, iii.

[3]Peter J. Schoomaker and Francis J. Harvey, *Army Energy Strategy for Installations* (Washington, D.C.: U.S. Department of the Army, 2005), introductory memo.

[4]U.S. Department of the Army, *Army Energy and Water Campaign Plan for Installations* (Washington, D.C.: U.S. Department of the Army, 2006), iv.

[5]Fournier and Westervelt, iii.

[6]Ibid.

[7]Ibid.

[8]Ibid, iv.

[9]Ibid, v.

[10]Schoomaker and Harvey, 3.

[11]Ibid.

[12]Fournier and Westervelt, iv.

[13]Henry Gignilliat, "Army Energy and Water Utilities Program: POM 08-13 Requirements," slides briefed to Installation Program Executive Group (PEG), Washington, D.C., The Pentagon, February 2006,15.

[14]U.S. Secretary of the Army Francis J. Harvey, "Energy Awareness Month-October 2006," memorandum for Principal Officials of Headquarters, U.S. Department of the Army, Washington, D.C., 23 September 2006.

[15]David R. Sands, "Fueling US Adversaries," *Washington Times Special Report*, 29 October 2006.

[16]Ibid.

[17]Jeffrey J. Schott, "Economic Sanctions, Oil and Iran," *Institute for International Economics,* 25 July 2006; available from http://www.peteroninstitute.org/publications/ papers/paper.cfm?ResearchID=649; Internet; accessed 24 February 2007, 1.

[18]Sands.

[19]Ibid.

[20]Fournier and Westervelt, x.

[21]George W. Bush, *The National Security Strategy of the United States of America* (Washington, D.C.: The White House, March 2006), 26-27.

[22]Ibid, 29.

[23]President's Council of Advisors on Science and Technology, *The Energy Imperative, Technology and the Role of Emerging Companies* (Washington, D.C.: President's Council of Advisors on Science and Technology, November 2006), 1.

[24]Bush, 29.

[25]Ibid.

[26]Ibid.

[27]Reset for 50 brigades (alone) consist of 350,000 pieces of equipment, including 615 aircraft; 7,000 combat vehicles; and 30,000 wheeled vehicles. See Francis J. Harvey and Peter J. Schoomaker, *A Statement on the Posture of the United States Army 2006: Posture Statement presented to Congress*, 109th Cong., 2d sess. 2006 (Washington, D.C.: U.S. Department of the Army, 2006), Figure 2.

[28]Bush, 1.

[29]Donald H. Rumsfeld, *The National Defense Strategy of the United States of America* (Washington, D.C.: The Pentagon, March 2005), iv.

[30]Richard B. Myers, *The National Military Strategy of the United States of America* (Washington, D.C.: The Pentagon, 2004), viii.

[31]Ibid.

[32]Joint Chiefs of Staff, *Joint Operation Planning*, Joint Publication 5-0 (Washington, D.C.: Joint Chiefs of Staff, 24 August 2006), GL-10.

[33]U.S. Army War College, *How the Army Runs*, (Carlisle, Pennsylvania: U.S. Army War College, 2005-2006), 131.

[34]Ibid, 133.

[35]Ibid, 156.

[36]Ibid, 155-156.

[37]"Army PPBE Training Course, An Overview of PPBE," briefing slides with scripted commentary, Washington, D.C., The Pentagon, August 2004.

[38]The author could not obtain a copy of the Technical Guidance Memorandum (TGM) due to some For Official Use Only (FOUO) information contained in the document and, therefore, could not cite it properly. However, it was general knowledge among resource programmers that the definition of critical requirements in the TGM was the minimum amount of resources required to meet the mission of the Army Campaign Plan.

[39]Henry Gignilliat, "Utility Services: POM 08-13 Requirements," slides briefed to the Installation Program Executive Group (PEG), Washington D.C., The Pentagon, February 2006, 18.

[40]The author was directly involved in the validation and submission of the installation (II) Program Evaluation Group (PEG) validated and critical requirements into the FY 08-13 Program Objective Memorandum (POM). She served as the Deputy Division Chief to the Resource Integration Office (RIO) of the Assistant Chief of Staff for Installation Management (ACSIM) from FY 2004 to FY 2006. The ACSIM RIO Division Chief was transitioning out of the Army and thus the duties to serve as Chairman to the Resource Analysis Team (RAT), which supported the II PEG during the POM process, were transferred to the Deputy.

[41]This is based upon the author's personal experience during the FY 08-13 POM build.

[42]Gignilliat, Utility Services, 5.

[43]Ibid, 7-9.

[44]Ibid.

[45]Isabella Clapp, "Validation of MDEP QDPW-J (Utilities)," memorandum for record, Washington, D.C., The Pentagon, 17 March 2006.

[46]Gignilliat, Utility Services, 10.

[47]Clapp, 2.

[48]Fournier and Westervelt, 57.

[49]President's Council of Advisors on Science and Technology, 4.

[50]Gignilliat, Army Energy and Water Utilities Program, 12.

[51]Harvey, 1.

[52]U.S. Department of Defense, *Installation Energy Management*, DOD Instruction 4170.11 (Washington, D.C.: U.S. Department of Defense, 22 November 2005), 2.

[53]U.S. Department of the Army, *Army Energy Program*, Army Regulation 11-27 (Washington, D.C.: U.S. Department of the Army, 3 February 1997), 1.

[54]Ibid, 9.

[55]Army Energy Program, "Secretary of the Army Energy and Water Management Awards" available from http://army-energy.hqda.pentagon.mil/awards/sec.army.asp/: award winner details; Internet: accessed 6 January 2007, 3.

[56]Gignilliat, Utility Services, 16.

[57]Army Energy Program, "Army's Energy and Water Management Program," available from http://army-energy.hqda.pentagon.mil/; Internet; accessed 6 January 2007.

[58]Joseph W. Whitaker, "Interim Policy Guidance – Army Energy Conservation," memorandum for Principles and Commanders, Washington, D.C., The Pentagon, 27 December 2005.

[59]Ibid.

[60]Joseph W. Whitaker, “Army Metering Implementation Plan,” memorandum for Office of the Deputy Undersecretary of Defense (Installations and Environment), Washington, D.C., The Pentagon, 6 September 2006.

[61]Ibid.

[62]Gignilliat, Utility Services, 16.

[63]Schoomaker and Harvey.

[64]Army Energy Program, “Army’s Energy Strategy and Campaign Plan,” available from http://army-energy.hqda.pentagon.mil/programs/plans.asp; Internet; accessed 26 September 2006.

[65]Schoomaker and Harvey, 2.

[66]Gignilliat, Army Energy and Water Utilities Program, 9.

[67]Ibid, 9.

[68]Isabella Clapp, “Validation of MDEP QUTM (Utilities Modernization),” memorandum for record, Washington, D.C., The Pentagon, March 2006.

[69]U.S. Department of the Army, *Army Energy and Water Campaign Plan for Installations*.

[70]Ibid, i-ii.

[71]Ibid, 25.

[72]Ibid.

[73]Ibid, 26.

[74]Army Energy Program, “Secretary of the Army Energy and Water Management Awards”, 2-3.

[75]Fournier and Westervelt, 29; quoted in Mayes, F., L. Guey-Lee, et al., *Renewable Energy Trends 2003* (EIA, 2004), p 39.

[76]Ibid.

[77]George W. Bush, “Advanced Energy Initiative,” 20 February 2006, available from http://www.whitehouse.gov/stateofunion/2006/energy/; Internet; accessed 25 December 2006.

[78]Ibid.

[79] U.S. Department of the Army, *Army Energy and Water Campaign Plan for Installations*, 66.

[80]Ibid.

[81]Ibid, 66-67.

[82]Office of the Deputy Under Secretary (Installations and Environment), *DOD Renewable Energy Assessment, Status Report Update, Report to Congress* (Washington, D.C.: Office of the Deputy Under Secretary, March 2006), 1.

[83]Ibid, 4.

[84]Schoomaker and Harvey, 4.

[85]Schoomaker and Harvey, introductory memo.

[86]Fournier and Westervelt, 55.